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ORIGINAL STUDY

The prevalence of COVID-19 infection in patients having autoimmune or chronic inflammatory rheumatic diseases

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Abstract

Objective: Patients who suffer from immune-mediated or chronic inflammatory rheumatic diseases show a varying likelihood of getting hospital-diagnosed COVID-19. This study helps to search the individual risk factors involved in COVID-19 susceptibility and to provide a basis to develop a better preventive recommendation to rheumatic patients.

Methods: We conducted a retrospective cohort analysis with patients being monitored and followed up in Mataria Teaching Hospital's rheumatology department. We compared newly updated datasets of adult rheumatology patients with positive PCR tests for COVID-19 that is conducted in the hospital and identified as having chronic inflammatory arthritis (IA), autoimmune or immune-mediated disease (AI/IMID) to the same reference populations. Furthermore, we examined PCR + verified COVID-19 rates also among groups. Between April and May 2020, after the incidence peak of severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV- 2) infection had been attained, patients' medical record IDs were checked and reviewed.

Results: The study included a hundred and eighty patients with autoimmune rheumatic diseases (mean age, 48.74 $\pm$ 13.25), and 88.5% were female. Compared to the reference population, patients with immune-mediated rheumatic diseases had a reduced prevalence of hospital PCR + COVID-19 (33.9% vs. 66.1%). Individuals with SPA did not exhibit a substantial rise in prevalence, in contrast to those with rheumatoid arthritis who displayed a significantly higher prevalence. In several diagnostic groupings, but not all, COVID-19 individuals were found to be older than those from the general population. While having a similar age distribution, patients with inflammatory arthritis who were on biological disease-modifying antirheumatic drugs (bDMARDs) had a lower prevalence than those on conventional-synthetic disease-modifying antirheumatic drugs (csDMARDs).

Conclusion: The risk of receiving a COVID-19 hospital diagnosis varies among patients with autoimmune rheumatic illnesses. Age, medications, and factors connected to diseases all appear to interact and have an impact. These findings serve as a foundation for strengthening preventive recommendations to rheumatic patients and for identifying the precise variables that influence COVID-19 susceptibility.

Keywords: Autoimmune diseases, COVID-19, Inflammatory arthritis, Rheumatic diseases, SARS-CoV-2

1. Introduction

The reported significant systemic and pulmonary inflammatory signs associated with SARS-CoV-2 infection have given rise to a theory that suggests a hyper-inflammatory mechanism that is more dependent on the host response than on direct viral cellular damage [1,2].

In order to tackle SARS-CoV-2, anti-inflammatory and immunomodulatory medications that have been licensed as treatment options for rheumatic disorders have been used quickly. It is unknown how common COVID-19 infection is in people with autoimmune or inflammatory illnesses. It is still unknown also what are the hazards or benefits of COVID-19 immunosuppressive therapy, as well as the vulnerability of rheumatic patients to COVID-19 infection. There has been speculation that certain immunomodulatory treatments for these people may have either a preventative or therapeutic effect.

Like corticosteroids, antimalarial, colchicine, and interleukin (IL)-6, all of which have questionable evidence yet are utilized in clinical trials or under exceptional circumstances [3].

Although the risks of these medications in the context of viral infections without concurrent antiviral therapies are not insignificant [4,5], For patients with rheumatic diseases, it is unknown whether immunosuppressant medications cause an increased or decreased risk for severe COVID-19 infection in them. As a result, we urgently need evidence to help us decide how to treat and prevent these infections [6,7].

2. Patients and methods

In the rheumatology departments of Mataria Teaching Hospital in Egypt, we did an observational retrospective study analysis with adult patients who had rheumatic disorders and were being followed up there. We checked and reviewed their updated medical records. These patients identified as having chronic inflammatory arthritis (IA) or systemic autoimmune or immune-mediated disorders like rheumatoid arthritis (RA), spondyloarthritis, psoriatic arthritis (PsA), Sjögren's syndrome (SS), systemic lupus erythematosus (SLE), systemic sclerosis (SSc) and inflammatory bowel disease. We also reviewed patients updated ID lists that were identified as having inflammatory arthritis and were receiving conventional synthetic disease-modifying antirheumatic medications (csDMARD), such as methotrexate or leflunomide, or biological disease-modifying antirheumatic medications (bDMARD), like infliximab, adalimumab or others. Throughout April and May 2020, following the incidence peak of COVID-19 infection in Egypt, patient's medical record IDs were compared to central SARS-CoV-2+ PCR hospital records. To formally establish the diagnosis of clinical COVID-19, medical records were examined. Since the SARS-CoV-2 PCR was not widely available. These registries only contain patients who visited referral hospitals and we excluded the cases that was less severe and did not necessitate hospitalization or referral to hospitals emergency departments. As rates in the various groupings, we provided the data and contrasted it

with rates in the overall reference population. Also, the mean age of the various groups was compared.

3. Results

The Ethnic Committee of the General Organization for Teaching Hospital and Institutes approved our study protocol. A total of 61 individuals were included in our retrospective cohort analysis who were being monitored in rheumatology departments after being tested with positive SARS-CoV-2 PCR results in the hospital. One hundred eighty participants made up the reference population at the participating Mataria Teaching Hospital. Compared to the non-rheumatic population, we discovered a decreased prevalence of PCR + patients (33.9% vs. 66.1%). Due to the lack of age information for PCR-negative cases, we are unable to determine the age-adjusted rates; however, PCR + rheumatic cases had a mean younger age than non-rheumatic disease cases (48 vs. 54 years old). The distributions of age and sex are displayed in (Table 1). Patients with inflammatory arthritis (RA, SLE, and PsA) displayed a variable prevalence with the higher prevalence in rheumatoid arthritis patients (23.9%), but a lower prevalence was found in patients with ankylosing spondylitis, Sjogren syndrome and inflammatory bowel syndrome (0.6%) (Fig. 1, Table 2). Patients with IA who were receiving treatment with a csDMARD (such as methotrexate or leflunomide) also displayed an elevated rate of COVID-19 infection (46 patients), in contrast to those receiving bDMARD therapy who displayed a lower rate of COVID-19 (15 patients) (Table 3). Certain diagnostic categories, but not all of them, were older than the reference population in terms of the age distribution of COVID-19 cases in the various IA and AI/IMID groups (Table 2).

3.1. Analysis of statistics

The Statistical Package for Social Science (SPSS) was used to collect, review, code, and enter the data (IBM SPSS statistics for windows, Version 23.0. Armonk. New York: IBM Corp. Released 2015). When parametric, we displayed the quantitative

Table 1. Age and sex distribution in rheumatic and nonrheumatic patients.

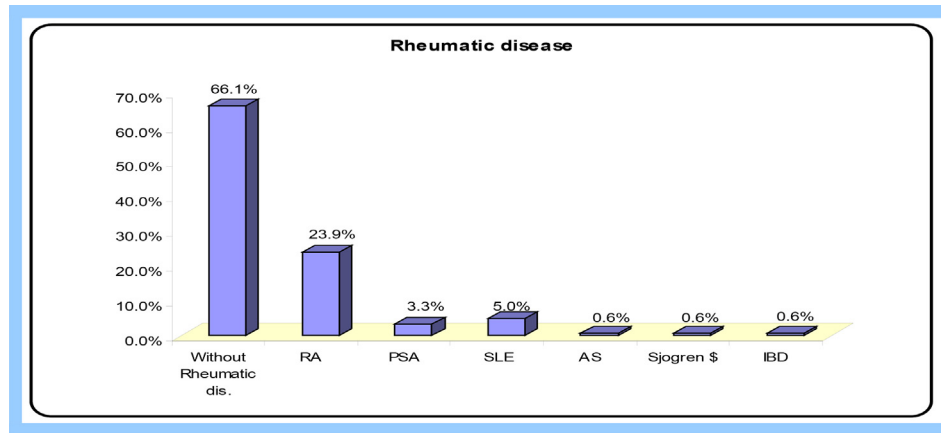|	Without Rheumatic disease No. = 119 (66.1%)	With Rheumatic disease No. = 61 (33.9%)	Test value	P value	Significance.
Age					
Mean ± SD	54.18 ± 17.00	48.74 ± 13.25	2.184	0.030	S
Range	17—82	17—79			
Sex					
Female	61 (51.3%)	54 (88.5%)	24.273	0.000	HS
Male	58 (48.7%)	7 (11.5%)			

Fig. 1. Rates of hospital COVID-19 in patients with autoimmune illnesses, chronic arthritis conditions, and general population.

data as mean, standard deviations, and ranges. We also provided qualitative characteristics as numbers and percentages.

Where the predicted count in any cell was less than 5, we compared the groups using the Chi-square test and/or Fisher exact test. To compare two groups in terms of quantitative data and parametric distribution, we employed the Independent t-test.

The allowable margin of error was set at 5%, while the confidence interval was set at 95%. Thus, we define p-value significance as: When the P value is greater than 0.05, the result is non-significant (NS), below 0.05, it is significant (S), and beyond 0.01, it is highly significant (HS).

4. Discussion

This study helped in identifying a sizable number of patients with confirmed COVID-19 infection and having rheumatic diseases on different immuno-modulatory therapies, and helped us to describe hospital COVID-19 prevalence and to recognize some linked factors that are associated with COVID-19 infection vulnerability in patients with rheumatic diseases.

Among rheumatologic patients receiving care at a single medical facility in Cairo, Egypt, we

Table 3. Drug therapy and comorbidities in rheumatic patients.

Drug Therapy	Patients with Rheumatic Diseases
Cs DMARD	Number (Percentage (%)) 46 (75.4%)
Biologics	15 (24.6%)
with Comorbidities	36 (59.0%)
without Comorbidities	25 (41.0%)

investigated the prevalence of COVID-19 cases. In individuals with inflammatory rheumatic joint disorders, COVID-19 was less common (33%) than in the general population. A varied prevalence among specific disease groups was found in patients with various systemic autoimmune diseases. We observed despite an anticipated increase in the use of immunosuppressive and biological treatments in patients with AS, inflammatory bowel disease, and SS, the COVID-19 rates are low. This contrasts with the large increase seen in our study's other rheumatic disease groups (RA, PSA, and SLE). Our results, which showed that COVID-19 was less common in people with chronic inflammatory rheumatic joint illnesses than in the general population, were consistent with information from a research by Nystad et al. [8].

In contrast to a meta-analysis of patients with rheumatic diseases, COVID-19 prevalence was

Table 2. Clinico-epidemiological features patients with chronic inflammatory and autoimmune systemic diseases.

Chronic Inflammatory and Autoimmune Systemic Diseases	Number of Rheumatic Patients	Female/Male	Age Mean (range)	Covid-19 prevalence %
Total	61	54/7	48.7 (17—79)	(33.9%)
Rheumatoid arthritis	43	38/5	50.2 (17—79)	(23.9%)
Psoriatic arthritis	6	6/0	52.2 (30—66)	(3.3%)
Systemic Lupus Erythrematosis	9	9/0	42.2 (22—59)	(5.0%)
Ankylosing Spondylitis	1	0/1	26	(0.6%)
Sjogren Syndrome	1	0/1	49	(0.6%)
Inflammatory Bowel Disease	1	1/0	37	(0.6%)

discovered to be considerably greater than in the control group [9]. Patients with systemic connective tissue disorders and vasculitis were also included in this meta-analysis group since they frequently complain of systemic inflammation and generally have more severe illnesses than patients with inflammatory rheumatic joint diseases. Prednisolone use was determined to be primarily responsible for the higher risk in these patients because they also use it more frequently.

The higher prevalence of Covid-19 infection in patients with rheumatic diseases without concurrent comorbidities was another intriguing finding. This unexpected observation finding may necessitate further research, but it also supports the idea that immunological dysfunction is the primary factor contributing to the higher prevalence of Covid-19 infection in patients with autoimmune systemic diseases [10].

Similar to the difficulty in explaining the increased prevalence of Covid-19 in patients not receiving csDMARD treatment, we can speculate that long-term administration of any of these modifying therapies (possibly hydroxyl-chloroquine) may play some protective role against infection with Covid-19, while other immune-modifying drugs, primarily like bDMARD and tsDMARD, their presence or absence seems to be unrelated to the occurrence of Covid-19 infection in agreement with data reported in previous studies elsewhere [11,12].

Hence, it did not appear that exposure to DMARDs, whether they were biological or synthetic, was related to a greater rate of hospital admission for COVID-19. Our results are consistent with information from other studies, despite the fact that we must take into account the small number of patients in our study [13,14].

Our results imply that patients who have systemic autoimmune illnesses do not have an elevated chance of or be more sensitive to acquire SARS-CoV-2 infection. Moreover, immunosuppression generally did not raise the probability of having severe COVID-19 [15]. Also, given that the majority of patients were receiving treatment, it may be assumed that immunosuppressive medications shouldn't be stopped in these circumstances. These findings are not unexpected given that the most serious side effects of tissue harm caused by SARS-CoV-2 appear to be mediated by a strong immunological response.

Ageing is an expected related risk factor in the majority of groups, however, there are a number of factors to take into account when interpreting these findings. Just those cases that necessitated care in hospital emergency departments and frequently hospitalization have been identified. As severity, but not prevalence, rises with age, it was anticipated that cohorts of rheumatic patients would have more severe cases [16,17]. Hospital COVID-19 patients are older than the reference population only in a small subset of cases. Consequently, despite the fact that older age is a proven risk factor, disease- or therapy-related factors also appear to change the risk for hospital COVID-19 cases in the various rheumatic patient groups.

We cannot exclude out bias for particular PCR tests in patients with rheumatic diseases, despite the fact that hospital attendance recommendations made by authorities were based on the severity of cases rather than the presence of pre-existing potential risk conditions. It is known that a sizable number of rheumatoid arthritis patients who have milder COVID-19 infections are still undiagnosed, and that their detection was relied on either self-reporting or phone consultations rather than validated PCR testing. Only future serological testing will be able to correctly estimate the true prevalence of severe and nonsevere cases among patients with rheumatic disorders as well as in the reference group without rheumatic diseases. These restrictions lead us to the conclusion that the risk of COVID-19 infection can vary depending on the autoimmune or chronic inflammatory condition, as well as the drug being taken.

Our findings on specific populations should be converted into the most recent recommendations for individuals with rheumatic disorders regarding infection risk awareness and preventive measures. Further research on the particular elements that might be responsible for the observed variations will hopefully help us better understand how the SARS-CoV-2 pandemic affects various risk categories.

Our study results should be interpreted taking other limitations into consideration. Firstly, patients enclosed were recruited from only a single center. Secondly, while it is agreed that when COVID-19 infection is suspected clinically, it must be confirmed by PCR testing, patients that are admitted almost 20% of them did not undergo PCR confirmation test because of the lack of tests or may be due to the extreme overload on healthcare workers. Nevertheless, all cases that is reported were compatible clinically as a case of COVID-19 and managed on that base.

Our study's main strength is that it was carried out under realistic circumstances during the rise of the pandemic, with access to our rheumatology electronic medical records to fulfil socio-demographic and clinical data, including thorough hospital admission data, including information data on

laboratory abnormal findings and information about COVID-19 management from hospital computer services. As a result, we are now able to assess the risk of hospital admission associated with COVID-19 infection after controlling for covariates, hence minimizing potential bias.

Despite the fact that we are unable to change the factors mentioned in this study, knowing about them can assist rheumatologists treat their patients and offer guidance to them during this novel and difficult time. Although the findings in our study are preliminary and require be confirmed by more real-world research, we believe they have the potential to advance understanding of how to treat people with COVID-19 and autoimmune rheumatic illnesses.

Conflicts of interest

There are no conflicts of interest.

Institutional Review Board (IRB) Approval Number

HM000131.

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